ultrasonic transducer **110** is manufactured, since the piezoelectric layer **120** is formed by coupling the sub-blocks **160** in units of columns, each sub-block **160** is tested before coupling the sub-blocks **160** and the sub-blocks **160** not having a uniform piezoelectric characteristic equal to or greater than a reference value are discarded, and thus dispersion of the piezoelectric characteristics of the piezoelectric elements **121** is decreased, thereby reducing a fluctuation in performance of the ultrasonic transducer **110** as much as possible.

FIGS. **18**A to **18**J illustrate a method of manufacturing an ultrasonic transducer according to another embodiment of the present invention.

As shown in FIG. **18**A, the piezoelectric bodies **222** having a flat plate shape may be prepared. As shown in FIG. **18**B, the upper and lower electrodes **223** and **224** may be provided on the top and bottom surfaces of the piezoelectric bodies **222** to form the piezoelectric layer **220**.

As shown in FIG. **18**C, the acoustic matching layers **240** having a flat plate shape may be prepared. The acoustic matching layer **240** may include the two layers **241** and **242** having different acoustic impedances.

As shown in FIG. **18**D, the piezoelectric layer **220** may be bonded to the support structure **251**, and the acoustic matching layers **240** may be bonded to the top surface of the piezoelectric layer **220**. The support structure **251** may be formed of a conductive material.

As shown in FIG. **18**E, a block including the piezoelectric layer **220** and the acoustic matching layers **240** having flat plate shapes may be cut in a vertical direction at equal intervals. FIG. **18**F illustrates one of a plurality of divided sub-blocks **260**.

As shown in FIG. **18**G, an electrode pattern may be formed in a side surface of the sub-block **260**. In other words, the side electrodes **225** electrically connected to the upper electrode **223** of the piezoelectric bodies **222** may be formed in side surfaces of the piezoelectric bodies **222**. The side electrodes **225** formed in the side surfaces of the piezoelectric material **222** may be formed in such a way that heights of the side electrodes **225** are gradually decreased or increased as described above.

As shown in FIG. **18**H, a plurality of kerfs **262** may be formed in the sub-block **260** in a depth direction at equal intervals. The kerfs **262** may be formed in such a way that heights of the kerfs **262** may reach a predetermined position of the support structure **251**.

As shown in FIG. **18**I, the side electrode substrates **231** in which the wiring lines **2312** may be provided may be bonded to a surface of the sub-block **260** in which the side electrodes **225** may be formed.

As shown in FIG. **18**J, the sub-blocks **260** to which the side electrode substrates **231** may be bonded may be arranged to be fixed to a top surface of a supporting block **252**. The support structure **251** and the supporting block **252** together may form the rear surface supporting unit **250**. The support structure **251** and the supporting block **252** may be formed of the same material or different materials. The first and second connection substrates **235** and **236** (see FIG. **11**) may be bonded to side ends of the side electrode substrate **231**, thereby completing the manufacture of the ultrasonic transducer **210** as shown in FIG. **11**.

The ultrasonic transducer, the ultrasonic probe, and the ultrasound image diagnosis apparatus according to the above-described one or more embodiments have the following effects.

Firstly, electrical signals may be respectively applied to a plurality of piezoelectric elements via a side electrode, and thus an electric connecting structure via the side electrode may be easily applied to a two-dimensional arrayed ultrasonic transducer, and further to a stacked structured ultrasonic transducer.

Secondly, when a single ultrasonic transducer is manufactured, a plurality of piezoelectric elements may be assembled in units of columns, and thus the piezoelectric elements may be tested in units of columns to decrease dispersion of piezoelectric characteristics, thereby possibly reducing a fluctuation in performance of the ultrasonic transducer.

While aspects of the present invention has been particularly shown and described with reference to differing embodiments thereof, it should be understood that these embodiments should be considered in a descriptive sense only and not for purposes of limitation. Descriptions of features or aspects within each embodiment should typically be considered as available for other similar features or aspects in the remaining embodiments. Suitable results may equally be achieved if the described techniques are performed in a different order and/or if components in a described system, architecture, device, or circuit are combined in a different manner and/or replaced or supplemented by other components or their equivalents.

Thus, although a few embodiments have been shown and described, with additional embodiments being equally available, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. An ultrasonic transducer comprising:

a plurality of piezoelectric elements arranged in at least one column;

individual electrodes provided on at least one surface of top and bottom surfaces of each of the plurality of piezoelectric elements;

a plurality of side electrodes each extending from the individual electrodes along one side surface of a corresponding piezoelectric element among the plurality of piezoelectric elements; and

a side electrode substrate comprising a plurality of wiring lines bonded to the one side surface of the corresponding piezoelectric element among the plurality of piezoelectric elements and electrically connected to the plurality of side electrodes, respectively,

wherein the plurality of piezoelectric elements are arranged in a two-dimensional array to be spaced apart from one another in columns and lines, and a plurality of the side electrode substrates, including the side electrode substrate, are inserted into gaps between the columns of the plurality of piezoelectric elements, and

wherein heights of the plurality of side electrodes of the piezoelectric elements of a first column are decreased in a lengthwise direction of the first column, and heights of the plurality of side electrodes of the piezoelectric elements of a second column adjacent to the first column are increased in the lengthwise direction of the second column.

2. The ultrasonic transducer of claim **1**, wherein the plurality of wiring lines of the side electrode substrate comprise first parts respectively facing the plurality of side electrodes, second parts extending toward one side ends of the side electrode substrate, and third parts exposed by the one side ends of the side electrode substrate.

3. The ultrasonic transducer of claim **2**, wherein a substrate body of the side electrode substrate is formed of an anisotropic electroconductive material having an electroconductive property in a thickness direction and having an insulating